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Field artillery must move rapidly as well as shoot accurately in order to do its job. An important argument as to the best way to move cannon has been, and still is, the argument of towed versus self-propelled artillery. The purpose of this paper is to chronicle and analyze this argument in the U.S. Army prior to 1955. The analysis shows that, of the many reasons cited in the argument, only self-propelled artillery's advantage of rapid occupation of position and its disadvantage of heavy weight were significant reasons. The paper concludes that by 1955 there was not a preponderance of opinion for either mode exclusively, which was quite proper, as there were many improvements to be made to both forms of artillery transport. In order to obtain these improvements by the best use of technology, soldiers must establish characteristics desired in materiel, and require industry to meet those characteristics.

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TOWED VERSUS SELF-PROPELLED ARTILLERY IN THE PERIOD PRIOR TO 1955: AN HISTORICAL INVESTIGATION OF THE ARGUMENT IN THE UNITED STATES ARMY

A thesis presented to the Faculty of the U. S. Army Command and General Staff College in partial fulfillment of the requirements of the degree

MASTER OF MILITARY ART AND SCIENCE

by
A. C. BOLE, JR., Maj, USA

Fort Leavenworth, Kansas
1966

U. S. ARMY COMMAND AND GENERAL STAFF COLLEGE

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The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U. S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

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Date 10 May 1966

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ABSTRACT

Field artillery must move rapidly as well as shoot accurately in order to do its job. An important argument as to the best way to move cannon has been, and still is, the argument of towed versus self-propelled artillery. The purpose of this paper is to chronicle and analyze this argument in the U. S. Army prior to 1955.

Chapter I describes the development of the materiel for mechanized artillery transport from 1916 to 1955. During this period there was very little change in the materials and technology used for the development of artillery vehicles and cannon. As a result, there was very little equipment for the proponents of either towed or self-propelled artillery to consider.

Chapter II recounts the history of the argument from its beginning until the United States' entry into World War II. The argument prior to World War II divides into two phases: 1919-1927, and 1923-1941, with the creation of the first U. S. Army armored forces being the divisor. During the first phase, rapid occupation of position was considered the chief advantage of self-propelled artillery, and lighter unit weight the chief advantage of towed artillery. By the end of the second phase, self-propelled artillery was considered almost exclusively for armored divisions, and towed artillery for infantry divisions.

Chapter III describes the experience of World War II with respect to artillery transport. During the war, virtually all armored division artillery was self-propelled and infantry division artillery towed. The

consensus was that self-propelled artillery was better for armored divisions.

Chapter IV discusses the period from after the war until 1955. For the most part, the post-war analyses continued in the same vein as the experience of the war: self-propelled artillery for armored divisions and towed artillery for infantry divisions. The Korean conflict emphasized advantages of self-propelled artillery in protecting itself from ground attack. The chapter ends with descriptions of new concepts for self-propelled artillery, based on new technology.

Chapter V summarizes, analyzes and concludes. The argument had changed very little during the period covered in this paper because the materiel had changed very little. The analysis shows that, of the many reasons cited in the argument, only self-propelled artillery's advantage of rapid occupation of position and its disadvantage of heavy weight were significant reasons. The chapter concludes that by 1955 there was not a preponderance of opinion for either towed or self-propelled artillery exclusively, which was quite proper, as there were many improvements to be made to both forms of artillery transport. In order to obtain these improvements by the best use of technology, soldiers must establish characteristics desired in materiel, and require industry to meet these characteristics.

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INTRODUCTION

The Problem

The mission of the U. S. Army field artillery is to provide continuous and timely fire support.[1] Traditionally, this mission has been divided into three tasks: to move, to shoot, and to communicate. The task of moving cannon has prompted many arguments as to the best form of artillery[2] transport. Before the advent of motor transport there was an argument as to which was better--horses or mules? With the introduction of motor vehicles there immediately came the argument of animals versus motors. Almost simultaneously came another argument: which was the better form of motor transport for artillery--towed or self-propelled?

This argument was an important one. It has influenced the effectiveness and tactics of both the artillery and the arms it supported, and affected the spending of large sums of money for artillery materiel. The purpose of this paper is to present the history of the argument of towed versus self-propelled artillery in the U. S. Army prior to 1955. The trends of the argument throughout the period cited will be traced to determine the factors that affected the argument. The argument will be analyzed to evaluate the validity of the reasons put forth by proponents of towed or self-propelled artillery. By recounting

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[1] U. S., Department of the Army, Field Artillery Tactics, FM 6-20-1 (Washington: U. S. Government Printing Office, Jul 65), p. 3.

[2] Throughout the rest of this paper, the term "artillery" will refer to field artillery.

the history and analyzing the argument, conclusions can be drawn as to how soldiers may best use technology for the military art.

The Approach

The approach is to determine the thinking and reasoning of proponents of either form of transport. Both official reports and documents, and writings of individuals are examined. For the latter, unofficial publications such as The Field Artillery Journal and Army Ordnance are used extensively. It should be pointed out that prior to World War II, these unofficial service publications were quite important as a forum for expressing current thinking concerning the service they represented.[3]

This paper is organized into five chapters. In Chapter I a description of the materiel upon which the argument was based prior to 1955 is presented. In Chapter II the history of the argument of towed versus self-propelled artillery is traced from its beginning at the close of World War I until the United States' entry into World War II. The experience of World War II as it relates to the argument is described in Chapter III. Chapter IV presents the analyses of World War II artillery transport experience, and traces the argument up to 1955. In Chapter V the argument is discussed and analyzed, and conclusions are presented.

Although tank destroyers were both towed and self-propelled and

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[3]For example, in 1922 the annual report of the Chief of Field Artillery was published only in The Field Artillery Journal (Vol. XII, No. 6 [Nov-Dec 22], p. 455.).

were employed at times as light[4] artillery, they will not be discussed in this paper. A thorough review of the pertinent literature reveals that the experience with tank destroyers did not contribute significantly to the argument of towed versus self-propelled artillery in the U. S. Army.

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[4]Throughout this paper the following classification of artillery according to caliber will be used: light--120mm or less; medium--greater than 120mm but not greater than 160mm; heavy--greater than 160mm but not greater than 210mm; very heavy--greater than 210mm. (FM 6-20-1, p. 5.)

CHAPTER I

THE MATERIEL

The discussion of the argument of towed versus self-propelled artillery in the U. S. Army prior to 1955 begins with a survey of the development of materiel for mechanized artillery transport. This development in the U. S. Army, beginning with towed artillery and followed by self-propelled artillery, will be described in this chapter.

Towed Artillery

The earliest prime movers for cannon were track-laying vehicles. Commercial farm tractors[1] were used to tow artillery in 1916, during the punitive expedition into Mexico.[2] In that same year, a 45 horsepower "Caterpillar" tractor was tested at Fort Sill, Oklahoma. It was used to tow a 4.7" gun and limber, or a 4.7" gun caisson and limber. The total weight, with either load, was 8½ tons.[3] The Field Artillery Board found this prime mover to be cheaper, easier to handle, and more mobile than horse teams.[4] Tractors, from commercial designs, were used extensively

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[1]The term "tractor" will be used to designate track-laying tractor throughout this paper.

[2]Col Lucian B. Moody, "Motorized Artillery," Army Ordnance, Vol. I, No. 1 (Jul-Aug 20), p. 8.

[3]Capt William Bryden, "Notes on the Recent Tractor Test at Fort Sill, Oklahoma," The Field Artillery Journal, Vol. VI, No. 1 (Jan-Mar 16), p. 51.

[4]"Motor Transport for Heavy Field Artillery," The Field Artillery Journal, Vol. VI, No. 2 (Apr-Jun 16), p. 201.

during World War I as prime movers for medium and heavy artillery. Tractors, rather than trucks, continued to be prime movers for towed artillery during the post-war period.[5]

In 1925 one battery of 155mm howitzers in Hawaii was converted from a tractor-drawn to a truck-drawn battery. The trucks proved to be faster and generally better than the tractors. However, artillery transport in Hawaii was rather specialized because almost all movement was over good roads and very little cross-country movement was required.[6] Another battery was equipped with trucks in 1932. After a trial of this battery, some light and medium battalions were converted to truck-drawn units. The trucks were of commercial design and had two-wheel drive.[7]

By 1941 nearly all light and medium artillery was truck-drawn. The principal prime movers in use were essentially of commercial design with the addition of front wheel drive, and had characteristics as shown in Table 1. The standard prime mover for heavy artillery was a "Caterpillar" tractor, also of commercial design, weighing 14½ tons and having a maximum speed of 9.4 mph.[8]

The trucks described in Table 1 were used throughout World War II and the Korean conflict. Near the end of the Korean conflict, the GMC 2½ ton truck was replaced by an improved 2½ ton truck, which was developed for use by the military, though not as an exclusively artillery prime mover. The Diamond T 4 ton truck was replaced by a 5 ton truck

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[5] The Field Artillery School, Automotive Instruction, (Fort Sill, Oklahoma: The Field Artillery School Reproduction Plant, 1941), p. 1.

[6] Maj Francis T. Colby, "155-mm Howitzers Towed by F. W. D. [Four Wheel Drive] Trucks in Hawaii," The Field Artillery Journal, Vol. XVI, No. 6 (Nov-Dec 26), pp. 588-596.

[7] Automotive Instruction, p. 1.

[8] Ibid., p. 355.

at this time. Here again, the truck was designed for general military use.

TABLE 1

1941 PRIME MOVERS FOR TOWED ARTILLERY[a]

Characteristics	Light Artillery	Medium Artillery
Cargo capacity	2½ tons[b]	4 tons[c]
Drive	six-wheel	six-wheel
Weight	5½ tons	8½ tons
Maximum speed	45 mph	40 mph

[a] Automotive Instruction, p. 350.

[b] This was the General Motors Corporation (GMC) 2½ ton truck.

[c] This was the Diamond T 4 ton truck

A half-track vehicle was also used as a light artillery prime mover during World War II, especially in North Africa. It was essentially a six-wheel drive armored truck with the rear dual tandem wheels replaced by tracks. The chief advantage of this prime mover over all-wheeled trucks was its better mobility in sand. It weighed 8 tons and had a maximum speed of 45 mph.[9]

The principal tractor used during both World War II and the Korean conflict was the M4 high-speed tractor. It was a medium artillery prime mover, weighed 15 tons and had a maximum speed of 30 mph.[10]

[9] Ibid., p. 350.

[10] U. S., War Department, Standard Military Motor Vehicles, TM 9-2800 (Washington: U. S. Government Printing Office, 6 Mar 43), p. 175.

Self-Propelled Artillery

The first self-propelled cannon was developed in the United States in 1916. Developed by the Holt Manufacturing Company,[11] it was a 3" anti-aircraft gun mounted on a track-laying chassis.[12] During World War I, the Holt company developed four models of self-propelled, track-laying artillery pieces from commercial "Caterpillar" tractors. Their characteristics are at Table 2.

TABLE 2

EARLY HOLT MANUFACTURING COMPANY SELF-PROPELLED CANNON[a]

Characteristics	Mark I	Mark II	Mark III	Mark IV
Caliber	8"	155mm gun	240mm howitzer	
Weight	29 tons	30 tons	53 tons	36 tons[b]
Maximum speed	4 mph	5.4 mph	4.3 mph	6.5 mph
Maximum elevation	45°	35°	60°	60°
Total traverse	8°	10°	2°	0°

[a] Maj Levin H. Campbell, Jr., "Self-Propelled Caterpillar Artillery Vehicles," Journal of the United States Artillery, Vol. LIV, No. 1 (Jan 21), p. 35.

[b] Weight listed is for each of two vehicles.

The Mark IV was developed to reduce the high unit weight of the Mark III. It consisted of two vehicles, one mounting the howitzer and the other a gasoline-driven generator. Each vehicle had an electric motor for

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[11] Now the Caterpillar Tractor Company.

[12] Maj Levin H. Campbell, Jr., "Self-Propelled Caterpillar Artillery Vehicles," Journal of the United States Artillery, Vol. LIV, No. 1 (Jan 21), p. 31.

propulsion and both were connected together by an electric cable. None of these four models saw combat.

In the post-World War I period, additional self-propelled mounts were developed by the Holt company. In 1919 a light artillery piece was made; an improved version was produced in 1922. A comparison of the characteristics of these vehicles are shown in Table 3.

TABLE 3

POST-WAR HOLT MANUFACTURING COMPANY SELF-PROPELLED CANNON

Characteristics	Mark VII (1919)[a]	Mark V (1922)[b]
Caliber	75mm gun	75mm gun or 105mm howitzer
Weight	5½ tons	6½ tons
Maximum speed	15 mph	30 mph
Maximum elevation	45°	. . . .[c]
Total traverse	28°	. . . .[c]

[a]Maj Levin H. Campbell, Jr., "Self-Propelled Caterpillar Artillery Vehicles," p. 35.

[b]The Holt Manufacturing Company, "A Few Photographs Showing Caterpillar Development for Military Purposes" (ca. 1922), pp. 11-12.

[c]Maximum elevation and total traverse for the Mark V were not given; the above reference implies that they were similar to those of the Mark VII.

An improved and larger mount for either the 8" howitzer or the 155mm gun was also developed during the post-World War I period. It weighed 22½ tons and could travel up to 16 mph.[13] All of these Holt models were developed from existing commercial-design "Caterpillar"

[13]The Holt Manufacturing Company, "A Few Photographs Showing Caterpillar Development for Military Purposes," pp. 14-15.

tractors. The cannon could be fired directly from the mounts, using spades or outriggers for stability. None had armor protection for the weapon or crew.

In 1919, a 155mm gun mounted on a Christie self-propelled mount was tested by the Ordnance Department. This mount could be converted from a wheeled vehicle to a tracked vehicle by the crew in from 15 to 30 minutes. The "wheeled or tracked" capability in the opinion of most gave greater flexibility than the "Caterpillar" mount because of the greater highway speeds possible in the wheeled configuration. Its characteristics are shown in Table 4.

TABLE 4

CHRISTIE SELF-PROPELLED 155M GUN[a]

Characteristics	
Weight	22 tons
Maximum speed, wheeled	20 mph
Maximum speed, tracked	8 mph
Maximum elevation	35°
Total traverse	12°

[a]"The Christie Self-Propelled Mount," The Field Artillery Journal, Vol. IX, No. 5 (Nov-Dec 19), pp. 603-604.

It was given both road and firing tests, and passed these satisfactorily. The testing section recommended this model for issue to the Army.[14] In 1921, another Christie self-propelled mount was made for

[14]Aberdeen Proving Ground, Proof Department, Gun and Carriage Section, "Final Test Report of Three Christie Wheeled Caterpillar Mounts for 155m/m Gun, Model 1918 (Filloux)," (Mar 21), pp. 51-53, 95.

either the 75mm gun or the 105mm howitzer. It had a shield for all-round protection of the crew and the carriage alone weighed 6½ tons.[15]

These Holt and Christie models were virtually the entire effort in the development of track-laying self-propelled artillery prior to World War II. Both the Field Artillery Board and the Ordnance Department conducted tests of this materiel in the 1920's and 1930's, but few developments or improvements resulted from these tests. Almost all comments pertaining to self-propelled artillery prior to World War II were based on this materiel developed during, or directly after, World War I.

Despite apparent advantages in weight, cost, simplicity, and ease of maintenance of wheeled vehicles over tracked vehicles, little was done with self-propelled, wheeled artillery. In 1918 an article in The Field Artillery Journal proposed "automobile artillery"--cannon mounted on truck chassis--in order to save weight.[16] It was not until 1930 that an experimental mount for a 75mm gun on a six wheel, four-wheel drive commercial truck was tested. The gun could be fired from the truck with the installation of outriggers on the truck. It had speeds up to 30 mph, a maximum elevation of 80°, and a 360° traverse. Light steel tracks could be installed on the rear wheels in five minutes, giving it a cross-country mobility equal to a tractor-drawn 75mm

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[15] "Motor Carriages for Divisional Artillery," The Field Artillery Journal, Vol. XI, No. 4 (Jul-Aug 21), p. 412.

[16] Lt Col Charles J. Browne, "The Tendency of Design in Modern Field Artillery," The Field Artillery Journal, Vol. VIII, No. 4 (Oct-Dec 18), p. 525.

gun. All tests, including firing tests, proved quite satisfactory.[17, 18] However, there was no further development of this mount. At the start of World War II there was a heavy, eight-wheel drive self-propelled mount for either the 3" gun, or 105mm howitzer under development.[19] Nothing came of this project, either.

The principal self-propelled U. S. Army artillery weapon in World War II was the M7 "Priest." Developed in late 1940 for British use in North Africa as a tank destroyer, the M7 was a 105mm howitzer and carriage mounted in an M3 tank chassis.[20] It had armor protection for the crew (but no overhead protection) and characteristics as shown in Table 5.

TABLE 5

SELF-PROPELLED 105-MM HOWITZER, M7[a]

Characteristics	
Weight	23½ tons
Maximum speed	23 mph
Maximum elevation	33°
Total traverse	38°

[a]U. S., War Department, 105-mm Howitzer Motor Carriage M7, TM 9-731E (Washington: U. S. Government Printing Office, 5 Jan 43), pp. 3, 133.

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[17]Maj G. M. Barnes, "75mm Gun Mount, T3, on 6-Wheel Truck Mount," The Field Artillery Journal, Vol. XX, No. 6 (Nov-Dec 30), pp. 666-670.

[18]Maj G. M. Barnes, "The Universal Gun and Mount T3," Army Ordnance, Vol. XI, No. 63 (Nov-Dec 30), pp. 187-190.

[19]The Field Artillery School, Instruction Memorandum: Construction of Field Artillery Materiel (Fort Sill, Oklahoma: The Field Artillery School Printing Plant, 1942), p. 62.

[20]Frank E. Comparato, Age of Great Guns (Harrisburg, Pennsylvania: The Stackpole Co., 1965), pp. 226-227.

Progress in developing other self-propelled cannon during World War II was slow. Next to the M7, the most successful self-propelled piece brought into service during the war was the 155mm self-propelled gun, M12. It was constructed by mounting a 1918 model 155mm gun[21] on a tank chassis, weighed 28 tons and had a maximum speed of 20 mph.[22] By the end of the war, other cannon calibers had been mounted on tank chassis, including the 240mm howitzer and 3" gun. These latter weapons saw little combat.[23]

Self-propelled artillery employed in the Korean conflict was essentially the same as used in World War II. Improved versions of the 3" howitzer and 155mm gun self-propelled mounts did see combat.[24]

All of the self-propelled cannon used during World War II and the Korean conflict were towed weapons modified so that they could be mounted on existing tank chassis. They had some armor protection for the crew, and were considerably heavier than the towed weapon with their prime movers. They had limited on-carriage traverse, and could not fire high-angle fire unless sited on a reverse slope.

The post-Korean conflict period saw the development of a new family of self-propelled weapons. Carriages and, in some cases, tubes, were developed or especially modified for these self-propelled pieces. They were lighter, had better traverse and elevation than their predecessors.

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[21] This was the same gun as on the Holt Mark II (p. 7.)

[22] Headquarters First United States Army, "Artillery Information Service, Memorandum No. 4," Jun 44, p. 46.

[23] Comparato, p. 353.

[24] Ibid., p. 232.

Summary

There were two significant aspects concerning the development of mechanized artillery materiel in the U. S. Army prior to 1955. First, there was very little change in the materials and technology used for the development of artillery vehicles and cannon. It was not until after 1955 that lighter metals, such as high-strength steel alloys and aluminum, and more powerful, but lighter, engines, more efficient transmissions and turrets were applied to the artillery vehicles. These technological advances gave the argument of towed versus self-propelled artillery a new cast.

Second, and closely allied with the first aspect, there was really very little materiel for the proponents of towed or self-propelled artillery to consider. This dearth of artillery transport equipment gave a sameness to the reasons cited in the argument of self-propelled versus towed artillery from the beginning of the argument to 1955.

CHAPTER II

THE ARGUMENT PRIOR TO WORLD WAR II

The Influence of World War I

World War I, in its classical static form of trench warfare, became an artilleryman's war, and ended with artillery recognized as the "King of Battles." In a 1917 directive to the French Army, General Petain gave instructions that attacks in the future were to be mounted "economically with infantry, and with the maximum of artillery."[1] This "maximum" was epitomized by the 1918 offense at St Mihiel, where over 1,400 cannon were massed to support an offensive on a 1.6 mile front.[2] Artillery bombardment was considered key to the success of any operation. Yet, despite the dependence on artillery, there were notable deficiencies in artillery performance--particularly with respect to artillery transport.

First, and perhaps the most serious of these deficiencies, was the inability of the artillery to keep up with the assaulting infantry. The very ground which the artillery had pulverized in order to breach the enemy trenches, was, because of the bombardment, impassable to the forward displacement of the cannon. This facet of artillery mobility

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[1]Richard M. Watt, Dare Call it Treason (New York: Simon and Schuster, Inc., 1963), p. 217.

[2]Frank E. Comparato, Age of Great Guns (Harrisburg, Pennsylvania: The Stackpole Co., 1965), p. 53.

was termed tactical mobility. Second, with the supply of artillery never fulfilling the need, it was important to move artillery units rapidly from one part of the front to another. Because of poor road nets and the slow forms of artillery transport available, the artillery was not able to make these moves very well. This facet of artillery transport was termed strategic mobility. Third, the poor response of animal transport to the tremendous demands placed upon it, demonstrated the need for different motive power. Additionally, the introduction of the tank to warfare gave rise to speculation as to the future use of tanks in war, and the artillery required to support it. These were the experiences of the war that were to influence thinking on artillery transport during the lull between the wars.

In 1918, the American Expeditionary Force (AEF) in France convened a board of officers (the Hero Board) to study the experience gained by the artillery of the AEF, and to submit recommendations based on its study. Headed by Brig Gen Andrew Hero, Jr., the board concluded that general army reserve artillery, corps artillery, and division artillery howitzers (155mm) should be tractor-drawn.[3] It also recommended that the 75mm materiel (standard caliber for division light artillery) be motorized by tractor, "if a suitable [one] can be found."[4]

Additionally, the report stated: "the board believes that very great expenditures for the purpose of fully developing a tractor-drawn

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[3]General Headquarters, American Expeditionary Forces, Office of the Chief of Artillery, "Proceedings of the Board of Officers," 9 Dec 18, p. 23.

[4]Ibid.

or tractor-carried [italics mine] artillery would be fully justified. . . ."[5] Major General Hinds, Chief of Field Artillery, concurred with this belief and urged that experiments along these lines should be "pushed with the greatest energy."[6] The Hero Board's recommendations pertaining to artillery transport were primarily from the view of animal versus motorized transport. But in expressing its belief concerning tractor-drawn or tractor-carried artillery, the board raised the question of what kind of motorized artillery transport the U. S. Army should have.

Following closely the Hero Board Report came the Westervelt Report[7] in 1919. Headed by Brig Gen William I. Westervelt, this board was convened by the War Department to study and make recommendations for artillery materiel for the field army.[8] Its report served as a guideline for development and discussion of artillery materiel throughout the period prior to World War II. This report was also referred to by some post-World War II reports.

The Westervelt Report quickly and almost summarily considered mechanical transport the only suitable type for artillery.[9] With respect to self-propelled artillery, the report stated that "while there is great promise for such, those at present in existence and under

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[5]Ibid., p. 25.

[6]Office, Chief of Field Artillery, "1st Indorsement to the Hero Board Report," 27 Mar 19, para. 12.

[7]Also referred to as the Caliber Board Report.

[8]U. S., War Department, "A Study of the Armament, Calibers and Types of Materiel, Kinds and Proportion of Ammunition, and Methods of Transport of the Artillery to be Assigned to a Field Army," 5 May 19.

[9]Ibid., p. 33.

test are, for the most part, excessively heavy."[10] It considered the strategic mobility of self-propelled artillery limited; the pieces would have to be transported by trucks, unloaded near the position areas, and employ their good tactical mobility to occupy positions.[11] Self-propelled artillery's ability to occupy positions rapidly was considered an important advantage:

> The 155mm. G. P. F.[12] [gun] self-propelled mount also presents immediate possibilities, especially when we realize that to fire, the vehicle simply has to come to rest, with the power plant running, whereas, upon its present wheeled carriage, several hours are normally required to prepare the firing emplacements.[13]

With respect to artillery transport overall, the Westervelt Board concluded that a practical plan for motorizing artillery was to have both towed and self-propelled light artillery, towed and self-propelled medium artillery, and towed heavy artillery. All towed artillery was to be tractor-drawn. Division artillery was to be towed. Trucks were to be used for ammunition and supply transport, and the battery detail section. The self-propelled 75mm gun was to be truck transported for strategic mobility.[14] The Westervelt Report marked the start of the argument in the U. S. Army of self-propelled versus towed artillery. The report favored neither, but did point out advantages and limitations of self-propelled artillery over towed artillery.

The First Phase: 1919-27

The first phase in the argument before World War II started with

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[10] Ibid., pp. 51-52.

[11] Ibid., p. 52.

[12] G. P. F.: Great Power [designed by Captain] Filloux

[13] Westervelt Report, p. 52.

[14] Ibid., p. 56.

the Westervelt Report and ended in 1927. In 1928, the U. S. Army began to experiment with armored forces; this gave a different bent to the argument of self-propelled versus towed artillery.

In 1920, The Field Artillery Journal printed an article on artillery transport which included a discussion of the merits of towed versus self-propelled artillery. Concerning light artillery, the author listed, as did the Westervelt Report, self-propelled artillery's advantage of being able to occupy and displace from positions rapidly. Additionally, he listed the advantages of smaller cargo space (for rail or boat shipment), less road space, and ability to fire throughout 360°[15] for self-propelled artillery. The author considered the heavy weight of self-propelled weapons a disadvantage, as did the Westervelt Report. Self-propelled weapons' greater size would make them more difficult to camouflage than towed weapons. He cited two disadvantages arising from the cannon being mounted on its prime mover. First, if the prime mover were disabled by either enemy action or mechanical breakdown, the cannon was out of action, too.[16] Second, the prime mover could not be used for any purpose (e.g., hauling ammunition) other than transporting the cannon.[17]

The author concluded that light self-propelled artillery could never replace towed artillery as division artillery. But he did feel

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[15]I assume the author meant that self-propelled pieces would turn the whole mount (rather than a turret) to fire throughout 360°. See page 19 and footnote 20.

[16]For brevity, throughout the rest of this paper, this disadvantage will be cited by the phrase: "prime mover out--cannon out."

[17]Henceforth, this often repeated disadvantage will be cited by the phrase: "inflexible prime mover."

that self-propelled artillery transported by trucks (similar to the system proposed by the Westervelt Report) could be used as reinforcing artillery. It appears that the consideration of strategic mobility outweighed tactical mobility advantages in this conclusion. The author further concluded that heavy self-propelled artillery was not practical because of the great weight inherent to this weapon.[18]

In Army Ordnance in the same year (1920), Col Lucian B. Moody listed as advantages of self-propelled artillery, rapidity in going into position and occupying less road space on the march. For towed artillery, he listed the advantages of less vehicle specialization (the antithesis of the "inflexible prime mover" disadvantage) and that it had been tested in war.[19] The next year (1921), Colonel Moody gave an additional advantage for self-propelled artillery: 360° field of fire by turning the entire mount.[20] He also listed an additional advantage of towed artillery, its lighter unit weight.[21]

In a prize-winning article for the Journal of the United States Artillery titled "Self-Propelled Track-Laying Artillery," Maj William T. Carpenter recalled the significance of tactical mobility in World War I.

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[18]Maj Webster A. Capron, "Ordnance Motor Equipment for Artillery Transport," The Field Artillery Journal, Vol. X, No. 5 (Sep-Oct 20), pp. 455-437.

[19]Col Lucian B. Moody, "Motorized Artillery," Army Ordnance, Vol. I, No. 1 (Jul-Aug 20), pp. 8-14.

[20]Light artillery was at this time principally aimed by direct fire techniques. Thus displacement from aiming stakes (used in indirect fire) was not a consideration in Colonel Moody's listing of this as an advantage.

[21]Col Lucian B. Moody, "Motorized Combat Transport," Army Ordnance, Vol. I, No. 6 (May-Jun 21), p. 303.

He went on to state:

> The greatest artillery product of the late war was the Self-Propelled Gun Mount, of the track laying type, though it played no active part in the war. It is certain that in the next great war, all other conditions being equal, the victory on land will rest with the side which can first bring into action a preponderence of artillery having the mobility to be obtained only with this type of gun carriage.[22]

Comparing tractor-drawn towed artillery with self-propelled artillery, he listed as advantages of the latter, ability to fire throughout 360° and to occupy positions rapidly, and less cargo and road space required. These had been cited before. Additionally, he listed greater speed and mobility, both tactical and strategic, the more stable gun mount, less fuel consumption, and less gun crew personnel. And, unlike other writers, he thought self-propelled weapons would be easier to camouflage.[23] The disadvantages he listed were "prime mover out--cannon out," higher unit weight of self-propelled mounts, and "inflexible prime mover." Major Carpenter thought the last disadvantage of little consequence.[24]

Major Carpenter predicted that in the next war tanks would lead the infantry, which would probably be motorized, and that tanks would meet more resistance than in World War I. Artillery would have to accompany tanks to combat tanks, machine gun nests, anti-tank guns, and light artillery. This tank-accompanying artillery would be primarily a direct fire weapon.[25] It is not too clear from his article how this type of artillery would differ from the tanks themselves. The article

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[22]Maj William T. Carpenter, "Self-Propelled Track-Laying Artillery: Part I," Journal of the United States Artillery, Vol. LIV, No. 4 (Apr 21), p. 321.

[23]Ibid., Part II, Vol. LIV, No. 5 (May 21), p. 450.

[24]Ibid., pp. 450-451. [25]Ibid., pp. 451-452.

is, however, among the first to discuss artillery with respect to armored forces.

In his annual report for 1922, the Chief of Field Artillery reported that, with respect to artillery transport, there was a wide difference of opinion as to whether division artillery should be horse- or tractor-drawn.[26]

In 1923, the Ordnance Department investigated cross-country vehicles which could serve all arms in forward echelons in the field. Based on its tests, the Department listed the following as disadvantages of self-propelled transport compared to towed loads, which could be trailers as well as cannon:[27]

--less efficient because towed artillery could be moved with less horsepower

--less mobility, both tactical and strategic, because of the greater unit weight

--"inflexible prime mover"

--"prime mover out--cannon out"

--more difficult to camouflage

--state of the art not developed enough

--too expensive.

The Department recommended that all self-propelled vehicles be eliminated at this time.[28]

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[26]"Annual Report of the Chief of Field Artillery for Fiscal 1922," The Field Artillery Journal, Vol. XII, No. 6 (Nov-Dec 22), p. 472.

[27]I have paraphrased the disadvantages actually cited to reflect their pertinence to artillery transport.

[28]"Universal Cross Country Cargo Vehicles," The Field Artillery Journal, Vol. XIII, No. 3 (May-Jun 23), pp. 250-255.

The same year (1923), the Field Artillery Board conducted tests over a six month period to determine the tactical usefulness of self-propelled mounts for light division artillery compared to horse- or tractor-drawn artillery. The board tested both the Holt and Christie light self-propelled weapons, and recommended that work on them be discontinued. It based this recommendation on reasons cited before: "prime mover out--cannon out," heavy unit weight, and difficulty in providing cover and concealment. Maintenance was also considered a problem, because self-propelled artillery could not be fired while work was being performed on the vehicular components. But, in the board's view, the most damning indictment against self-propelled artillery was the unreliability of its vehicular components.[29] The board considered horses to be more reliable, and more mobile, both tactically and strategically, and in general, favored animal transport over mechanical transport.[30]

The Chief of Field Artillery, in his annual report for 1923, recommended that division artillery be horse-drawn, not motorized.[31]

Summary.--During the first phase of the argument of towed versus self-propelled artillery, there was another, concurrent argument: horse-drawn artillery versus motorized artillery. This latter argument (as well as most other contemporary arguments about field artillery)

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[29]The board also considered that vehicles in general required more maintenance and skill than horses.

[30]"Horses, Tractors and Self-Propelled Mounts," The Field Artillery Journal, Vol. XIII, No. 6 (Nov-Dec 23), pp. 472-492.

[31]"Annual Report of the Chief of Field Artillery," The Field Artillery Journal, Vol. XIV, No. 2 (Mar-Apr 24), p. 117.

pertained to division light artillery. Most of the arguments pertaining to towed versus self-propelled artillery were stated in terms of advantages and disadvantages of self-propelled artillery, rather than advantages of self-propelled artillery and advantages of towed artillery. In most cases it can be inferred that disadvantages of self-propelled artillery were, concurrently, advantages of towed artillery.

There appears to have been general agreement that self-propelled artillery was the best configuration for occupying positions rapidly. This was considered the prime advantage at this time. Opinion seems to be divided as to whether or not self-propelled artillery was better than towed artillery with respect to tactical mobility. Self-propelled artillery was not rated highly from the standpoint of strategic mobility. But, recalling that at this time towed artillery was tractor-drawn, this last named deficiency might apply to both forms of mechanized artillery transport. To achieve adequate strategic mobility, both self-propelled, towed, and horse-drawn artillery would have to be transported to the battlefront by truck.

Of the technical advantages of self-propelled artillery, its ability to fire throughout 360° by shifting the entire mount was almost universally propounded. This advantage must be viewed in the light of the preponderence of direct fire gunnery for light artillery at this time. The heavy unit weight of self-propelled mounts was the chief disadvantage. Weight affected their strategic and tactical mobility by limiting their bridge crossing capability. The uniting of the cannon to the prime mover raised two other reasons as disadvantages of self-propelled artillery: "prime mover out--cannon out" and "inflexible prime mover."

Neither the Aero Board or Westervelt Board reports, nor the writers in military publications cited considered to any extent the mechanical limitations of self-propelled artillery. Nor did any of the above do much testing of equipment. Both the reports from the Ordnance Department and the Field Artillery Board were based on tests and both of these organizations considered mechanical limitations quite important reasons for not adopting self-propelled artillery at this time. It would appear that the state of the art was not sufficiently developed to produce reliable self-propelled artillery.

Little consideration was given during this phase to artillery with armored forces. Nor was the truck evaluated as a means of towing artillery.

The Second Phase: 1928-41

In 1928, the War Department created a Mechanized Force on an experimental basis. This force was a non-divisional, self-contained organization with tanks as its main weapons, possessing great mobility and striking power for offensive action.[32] The consideration of artillery support for this Mechanized Force marked the beginning of the second phase of the argument of towed versus self-propelled artillery in the U. S. Army prior to World War II. Artillery support for the Mechanized Force and the armored forces which followed was to be the first of two principal factors influencing the argument of towed versus self-propelled artillery during this second phase. The second factor was that the U. S. Army received very little money during this time.

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[32]"The Experimental Mechanized Force," The Field Artillery Journal, Vol. XVIII, No. 4 (Jul-Aug 28), pp. 386-392.

This second factor was to prevent much materiel of any sort from being developed for the Army, and to cause Army planners to consider materiel for equipping the Army in terms of strict austerity.

Artillery for the Mechanized Force was primarily tractor-drawn light artillery, with trucks to transport both cannon and prime movers on long road marches to enhance strategic mobility. Additionally, the Holt light self-propelled mounts, built seven years before, were used.[33, 34]

The self-propelled artillery with the Mechanized Force did not perform too well. An observer reported that the pieces were not fast enough, were unreliable, and required too much time for firing preparations. How many of these deficiencies were caused by the state of the art, or how many were caused by the state of the equipment, cannot be determined. The observer recommended that light artillery with the Mechanized Force be truck-drawn, since tractors were too slow, and the transport of tractor-drawn sections was not very satisfactory.[35]

But another artilleryman thought differently. Though admitting the existing self-propelled artillery was not adequate, Maj Rene E. DeR. Hoyle stated:

> Self-propelled artillery is considered absolutely necessary to a mechanized force. To build a tank sufficiently large for carrying light and medium guns and howitzers calls for the "Land Battleship," slow-moving and a most vulnerable target. It has no place in our Mechanized Force. Self-propelled artillery can be fast moving and present a small target and must be close at hand to support the

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[33] Ibid.

[34] Lt Col P. D. Glassford, "The Mechanized Force. Facts and Theories," The Field Artillery Journal, Vol. XVIII, No. 6 (Nov-Dec 28), pp. 624-630.

[35] Ibid.

advance of the light and medium tanks.[36]

He went on to list advantages of self-propelled artillery: it could occupy positions rapidly and required smaller crews. Major Hoyle implied that armor protection for the crews might be integral with self-propelled artillery. This was, perhaps, the first indication that armor protection was an advantage of self-propelled artillery; later, the terms "armored artillery" and "self-propelled artillery" were to become almost synonymous. As disadvantages, he listed the almost (by now) traditional "prime mover out--cannon out" and "inflexible prime mover" characteristics. Major Hoyle further pointed out that civilian vehicles could not be impressed as self-propelled mounts; purely military vehicles must be used.[37] This last point was listed perhaps in light of the United States' difficulty in producing arms during World War I.

The use of commercial vehicles in production was considered from a different tack by another artilleryman. Writing in The Field Artillery Journal in 1929, Maj L. R. Cole stated: "Most serious [limitation] of all is the fact that it [self-propelled artillery] is an exclusively military design and does not fit in with any commercial need, hence only a limited number of manufacturers will be prepared to produce it in emergencies."[38] He listed as additional disadvantages, self-propelled artillery's heavy weight, difficulty of concealment, and

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[36]Maj Rene E. DeR. Hoyle, "Mechanization," The Field Artillery Journal, Vol. XVIII, No. 3 (May-Jun 28), p. 243.

[37]Ibid., p. 244.

[38]Maj L. R. Cole, "All-Purpose Artillery Traction," The Field Artillery Journal, Vol. XIX, No. 6 (Nov-Dec 29), p. 647.

"prime mover out--cannon out." With respect to mechanical limitations, he cited the necessity for turning the entire mount to traverse and that the pieces were complicated and expensive.[39] However, Major Cole considered a track-laying capability key to prime movers, and propounded a solution of wheeled vehicles convertible to tracked vehicles (as the Christie vehicles).[40]

In 1930, General Summerall, the Chief of Staff, recalled the need for artillery to accompany the infantry in the assault in World War I. He felt that there was still a real need for an accompanying gun, and that it should be self-propelled. He did not think there was yet a suitable design for this weapon. It would have to have good tactical mobility, and must have crew protection. Further, he stated that self-propelled artillery was "indispensable for a mechanized force." Quite significantly, he went on to state that the mechanized force self-propelled artillery should be employed in batteries.[41] Up to this time, artillery with mechanized [armored] forces had been thought of in the form of individual guns accompanying tanks.

The use of self-propelled cannon as accompanying guns for the infantry was tested by the Infantry Board in 1931. The Holt light artillery piece of 1920-21 was used in the test. The board concluded that a self-propelled gun "of proper construction" was the most desirable for an accompanying gun.[42]

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[39] Ibid., pp. 644-657. [40] Ibid.

[41] Gen C. P. Summerall, "Field Artillery Progress," The Field Artillery Journal, Vol. XX, No. 6 (Nov-Dec 30), pp. 605-606.

[42] Capt Ivan J. Foster, "A Test of an Accompanying Gun," The Field Artillery Journal, Vol. XXI, No. 3 (May-Jun 31), pp. 321-329.

As the second decade after World War I wore on, the truck replaced the tractor for towed artillery. The trucks were faster and more reliable than the tractors, which were basically of World War I design. Less and less was heard about self-propelled artillery which was still of World War I design and manufacture. In 1935, the Field Artillery School stated that the trend toward artillery motorization was marked by the use of trucks as prime movers. They were cheaper and more readily available in mobilization [than other forms of mechanical transport].[43] In 1936, 1st Lt Francis J. Hall in his thesis for the Artillery Advanced Course titled "Organization, Armament, and Tactical Employment of Field Artillery with Mechanized Cavalry," wrote that there was no self-propelled artillery in use in the U. S. Army at that time. Self-propelled artillery could, he thought, have good cross-country mobility and provide armor for crew protection. But it would be complicated, and the familiar "prime mover out--cannon out" disadvantage--from the standpoint of mechanical reliability rather than enemy action--was cited by Lieutenant Hall. He concluded that trucks of commercial design would be adequate for mechanized [armored] forces because they had sufficient mobility and were cheaper.[44]

The spectacle of World War II in Europe and the success of the German "Panzer" divisions renewed interest in armored forces in the

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[43]The Field Artillery School, Digest of Field Artillery Developments (Fort Sill, Oklahoma: The Field Artillery School Printing Plant, 1935), p. 63.

[44]1st Lt Francis J. Hall, "Organization, Armament, and Tactical Employment of Field Artillery with Mechanized Cavalry" (unpublished Regular Artillery Advanced Course dissertation, The Field Artillery School, Fort Sill, Oklahoma, 1935), pp. 10-21.

U. S. Army, and in artillery to support them. In 1941, the newly formed 2d Armored Division was employed in maneuvers in Tennessee. Artillery with the division was 75mm guns towed by half-tracks. An observer at the maneuvers considered the half-tracks satisfactory, but thought armored divisions should have self-propelled artillery.[45]

At about the time of the United States' entrance into World War II, the Field Artillery School listed one advantage of self-propelled artillery: greater speed in occupying positions. The school considered that "due to tactical employment," self-propelled artillery would require armor protection for crew and ammunition, and therefore, heavy weight due to armor was its chief disadvantage. Other disadvantages were difficulty of concealment, and the unavailability of the cannon while the vehicular components were being maintained.[46] It appears that the Field Artillery School considered towed artillery the principal kind with respect to artillery transport in the U. S. Army; self-propelled artillery was a special kind and of limited importance.

Summary.--In the second phase of the argument of towed versus self-propelled artillery in the U. S. Army prior to World War II, self-propelled artillery became almost exclusively considered with respect to armored forces. In this light, its chief advantages were ability to occupy positions rapidly and capability for armor protection. The advantage cited in the first phase, of fire throughout 360° by turning the

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[45]Maj Lawrence Collins, "Armored Field Artillery in the Tennessee Maneuvers," The Field Artillery Journal, Vol. XXXI, No. 9 (Sep 41), pp. 698-699.

[46]The Field Artillery School, Instruction Memorandum: Construction of Field Artillery Materiel (Fort Sill, Oklahoma: The Field Artillery School Printing Plant, 1942), p. 61.

entire mount, was no longer an advantage because satisfactory indirect fire procedures had been developed for light artillery. In fact, the small on-carriage traverse of self-propelled pieces of this time was a disadvantage.[47] Other disadvantages of self-propelled artillery were cited in both phases: "prime mover out--cannon out," heavy unit weight (now increased with armor), and difficulty of concealment. During the second phase, mechanical limitations and problems of maintenance were disadvantages that came to the fore. It appears that the many disadvantages of self-propelled artillery contributed to the argument for towed artillery.

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[47] Indirect fire procedures required the exact alignment of cannon with respect to aiming stakes. Turning of the entire self-propelled mount for large deflection shifts made realignment of the aiming stakes necessary--a time consuming procedure. This procedure was not generally required for the comparable case (shifting trails) in towed artillery.

CHAPTER III

THE EXPERIENCE OF WORLD WAR II

The Setting

It was pointed out in Chapter II that with the beginnings of the U. S. Army's armored forces, the argument of towed versus self-propelled artillery became an argument of which of these two forms of artillery transport was better for armored forces, rather than which was better for the U. S. Army throughout. The experience of World War II continued on this tack to the argument. Although initially not all armored divisions were equipped with self-propelled weapons, by the end of the war all had self-propelled artillery. There appear to have been few instances of self-propelled artillery being used in direct support of infantry divisions during World War II. Two self-propelled artillery battalions supported an infantry division in the Normandy invasion,[1] armored division artillery was used at times in support of infantry divisions, and the 4th Infantry Division Artillery had self-propelled cannon for a time.[2] However, for the most part, artillery with infantry divisions was towed.

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[1]Lt Col Paul P. Hinkley, et al., "Operations of Armored Field Artillery Battalions: A Research Report" (Fort Knox, Kentucky: The Armored School, 1949-1950), p. 25.

[2]Headquarters United States Forces, European Theater of Operations, "Report of the General Board: Study of the Organization, Equipment and Tactical Employment of the Infantry Division (ca. 1946), Appendix 15, p. 10.

There appears to have been little self-propelled artillery used in the Pacific theaters of operations. There were no armored divisions assigned there.[3] Of the 67 divisions that saw combat in the European or Mediterranean Theaters of Operations, 16 were armored divisions.[4] Thus it was in Europe (and North Africa) where self-propelled artillery could be compared with towed artillery. The self-propelled artillery was primarily with armored divisions, which were a considerable portion of the U. S. Army's combat power in that part of the world. Two models of self-propelled cannon predominated: the self-propelled 105mm howitzer, M7, and the self-propelled 155mm gun, M12.[5] Although the half-track was used as a prime mover for towed artillery (particularly in North Africa), the principal prime movers for towed artillery were the 2½ ton truck for light artillery, the 4 ton truck for medium artillery, and the heavy tractor for heavy artillery.

The argument of towed versus self-propelled artillery, as it related to the experience of World War II, was with respect to the advantages and disadvantages of self-propelled artillery in armored divisions. There seems to have been little consideration of self-propelled artillery for other type divisions.

This chapter will address itself to considering the experience of the war as it relates to the advantages and disadvantages of self-propelled artillery developed during the argument prior to World War II.

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[3] Combat Divisions of World War II (Washington: Army Times, ca. 1945), pp. 1-96.

[4] Ibid.

[5] For brevity, these two pieces will be referred to as the M7 and M12, respectively, throughout this chapter.

The Advantages of Self-Propelled Artillery

Rapid occupation of position.--From the very beginning of the argument, this seemed a very important advantage. The Westervelt Board cited rapid occupation of position as important; and afterwards, almost every opinion on self-propelled artillery, whether pro or con, considered it an important advantage. Col A. Graham, 4th Armored Division Artillery Commander, considered rapid occupation of positions very important in the argument for self-propelled artillery.[6] Lt Col Hugh M. Exton, an M7 battalion commander in both North Africa and Europe, felt his pieces better in this respect than towed pieces. However, he did not consider it to be as important as the better tactical mobility of self-propelled artillery.[7] Col A. K. Kurtz, 14th Armored Division Artillery Commander, also considered self-propelled artillery quicker in occupying positions, but that this was not as significant as the armor protection of self-propelled artillery.[8] Col Frederic J. Brown, 3d Armored Division Artillery Commander, writing about the M12 (Colonels Graham and Kurtz were referring primarily to the M7), thought the better tactical mobility of the M12 more important than rapid occupation of position.[9]

No one seemed to think self-propelled artillery was slower than towed artillery in occupying positions; however, this advantage did not

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[6]Col A. K. Kurtz, "Self-Propelled vs. Towed Artillery, Ammunition," (3d U. S. Army Artillery Conference, 1945), p. 16.

[7]Lt Col Hugh M. Exton, "From Morocco to Berlin," The Field Artillery Journal, Vol. XXXVIII, No. 3 (May-Jun 43), p. 103.

[8]Kurtz, pp. 13-16.

[9]Col Frederic J. Brown, "Spearhead Artillery: The Story of the 3d Armored Division Artillery," The Field Artillery Journal, Vol. XXXVI, No. 9 (Sep 46), p. 506.

appear as important in the experience of the war. The many times self-propelled cannon were used for assault fire[10] (especially the M12) indicates that in this employment at least, rapid occupation of position was a significant advantage of self-propelled artillery.[11,12]

Armor protection.--Armor protection had been considered important in the second phase[13] of the argument between the wars. Colonel Kurtz (CO, 14th Armored Division Artillery) thought it quite important;[14] Colonel Exton (CO, M7 battalion), an advantage.[15] Col Carl I. Hutton, commander of an M7 battalion and later, 2d Armored Division Artillery Commander, liked the armor protection of the M7 because of its value in fire fights with infantry and tanks.[16] But reports from three M12 battalions stated that armor protection was not too important.[17] The M12's, being medium artillery, were generally further to the rear than the M7's; however, they did fire many assault fire missions. Armor

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[10]Assault fire in artillery is extremely accurate, short range destruction fire at point targets (Dictionary of United States Army Terms, AR 320-5 [Washington: U. S. Government Printing Office, Apr 65], p. 49.) One piece of medium or heavy artillery is usually employed for each target. Because of the short range (the target is within sight of the cannon), cannon firing assault fire missions quite often soon come under small arms and intense counterbattery fire.

[11]Headquarters First United States Army, "Artillery Information Service, Memorandum No. 4" (Jun 44), p. 46.

[12]Headquarters First United States Army, "Artillery Information Service, Memorandum No. 7" (Dec 44), pp. 16-22.

[13]The terms "second phase" and "first phase" refer to the two phases of the argument prior to World War II developed in Chapter II (pp. 17, 24).

[14]Kurtz, p. 13.

[15]Exton, p. 108.

[16]Col Carl I. Hutton, "An Armored Field Artillery Commander in the European Theater" (Fort Sill, Oklahoma, 1951), p. 251.

[17]"Artillery Information Service, Memorandum No. 7," p. 98.

protection obviously added to the weight of the pieces; there seems to have been little evaluation as to whether the protection was worth the weight.

Mobility.--Many of the arguments prior to World War II made a careful distinction between tactical and strategic mobility. This distinction was not generally made with respect to artillery transport in World War II. Mobility in World War II meant cross-country mobility and can be equated for the most part to the earlier term, tactical mobility. Lt Lewis R. Scoffer, writing about his M12 battalion in support of the 3d Armored Division, reported that the superior mobility of self-propelled medium artillery was very important. In the breakout across Northern France, his battalion was the only artillery heavier than 105mm howitzers[18] that could keep up with the "Spearhead Division."[19] The 1st U. S. Army, reporting on three M12 battalions (including Lieutenant Scoffer's), stated: "The primary advantage of self-propelled artillery lies in its tactical mobility. . . ."[20] Lt Col J. M. McPheeters, commander of an M7 battalion, reported that his pieces could go almost everywhere.[21] Colonel Exton (CO, M7 battalion) considered the excellent mobility of the M7 the outstanding characteristic

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[18]Artillery organic to armored divisions in World War II was three M7 battalions. Heavier artillery was attached. Infantry divisions had three 105mm and one 155mm howitzer battalions organic.

[19]Lt Lewis R. Scoffer, "An M12 Battalion in Combat," The Field Artillery Journal, Vol. XXXV, No. 1 (Jan 45), pp. 29-31.

[20]"Artillery Information Service, Memorandum No. 7," p. 98.

[21]Army Ground Forces Board, "Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 33.

of self-propelled artillery.[22]

Though there seems to be general agreement that the M12 had superior mobility to comparable towed calibers, not all thought the M7 was superior to the towed 105mm howitzer. Colonel Kurtz (CO, 14th Armored Division Artillery) thought the M7 had some mobility advantage, but qualified this with his observation that the truck was better than the M7 in mud.[23] Indicating, perhaps, the state of the art at the time, Colonel Kurtz pointed out that neither towed nor self-propelled artillery could negotiate all types of terrain.[24] The 1st U. S. Army had this to say about the M7:

> While it has been proved [in North Africa and Italy] that the motor carriage M-7 possesses ability to negotiate rough terrain, it has been found that truck drawn artillery has been able to negotiate successfully any terrain required of the M-7 (with the exception of deep sand). Self-propelled artillery weapons are well suited for employment in direct support of amphibious assaults and executed over beaches of a sandy nature.[25]

The 10th Field Artillery Battalion, reporting on operations in Sicily also considered the M7's excellent for landing operations, but after the landing, "white elephants." The towed 105's, it felt, were just as mobile as the M7's.[26]

Surely no commander would argue that good mobility was not important for artillery. But it appears that not all self-propelled weapons were universally acclaimed in World War II as having superior mobility than that of towed artillery.

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[22]Exton, p. 103. [23]Kurtz, p. 13. [24]Ibid.

[25]Headquarters First United States Army, "Artillery Information Service, Memorandum No. 1" (ca. Jan 44), p. 13.

[26]Headquarters 10th Field Artillery Battalion, "Notes and Lessons of the Sicilian Campaign" (29 Jul 43), p. 1.

Other advantages.--Colonel Exton (CO, M7 battalion) considered the capability of the M7 to carry ammunition with it an advantage, but not as important an advantage as mobility or armor protection.[27] Colonel Kurtz listed as a disadvantage of towed artillery the accumulation of mud and/or ice on the cannon when towed in bad weather. Self-propelled cannon did not have this problem, he observed.[28]

The Disadvantages of Self-Propelled Artillery

Heavy weight.--This was considered the greatest disadvantage in the first phase of the argument prior to World War II, and a significant disadvantage in the second phase. Colonels Kurtz and Exton considered it the greatest disadvantage of self-propelled artillery.[29, 30] In a summary of artillery combat experience, the Field Artillery School reported that towed artillery had better weight distribution.[31] The heavy weight of the M12 created problems in crossing bridges.[32] It appears that heavy weight, per se, was not as much of a disadvantage as was thought earlier. It probably did have an effect on mobility, however.

"Prime mover out--cannon out."--This disadvantage was important in both phases of the argument prior to World War II; however, there

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[27]Lt Col Hugh M. Exton, "From Morocco to Berlin," The Field Artillery Journal, Vol. XXXVIII, No. 4 (Jul-Aug 48), p. 188.

[28]Kurtz, p. 14.

[29]Ibid.

[30]Exton, Vol. XXXVIII, No. 4, p. 108.

[31]The Field Artillery School, "Secret Information Summary Number One" (Fort Sill, Oklahoma, Feb 44), p. 129. (This report has been declassified).

[32]"Artillery Information Service, Memorandum No. 4," p. 46.

was surprisingly little mention of this as a disadvantage during World War II. Maj C. R. Revie, who commanded a battalion equipped at first with towed 105's, and later with M7's, considered "prime mover out--cannon out" a significant disadvantage.[33]

Two factors tended to cloud the issue of "prime mover out--cannon out," per se, as a disadvantage. The first was the amount of maintenance problems. If a commander had few problems in keeping all of his pieces operational, then "prime mover out--cannon out" had little significance for him. (Maintenance problems will be discussed following.) The second factor was the difference in numbers of cannon in artillery batteries; towed batteries had four cannon, the M7 batteries, six.[34, 35] A self-propelled artillery battalion commander with six pieces out of action could still get as much steel on the target as his towed artillery counterpart.[36]

Maintenance problems.--All machinery poses maintenance problems; self-propelled cannon had more problems than towed cannon and their prime movers primarily because they were more complex machines with more parts. Also, the lack of expertise in maintaining track-laying vehicles

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[33]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[34]U. S., War Department, Tactics and Technique: Battalion and Battery, Motorized, FM 6-101 (Washington: U. S. Government Printing Office, 28 Jun 44), p. 220.

[35]U. S., War Department, Armored Division Artillery, FM 6-105 (Washington: U. S. Government Printing Office, 15 Aug 44), p. 2.

[36]The U. S. Army changed to six cannon per firing battery for all light and medium artillery units after World War II, largely based on the greater destruction wrought by six cannon compared to four, as demonstrated by armored division artillery.

contributed to the greater number of maintenance problems of self-propelled artillery. Self-propelled artillery's disadvantage of greater maintenance problems was emphasized in the second phase of the argument prior to World War II. Major Revie (CO, towed 105mm howitzer, later M7, battalion) considered maintenance problems as a serious disadvantage. He reported that his M7's needed from one to two days of maintenance for every 500 miles travelled.[37] The 1st U. S. Army, reporting about M7's, pointed out increased maintenance as a disadvantage of self-propelled cannon;[38] so did the Field Artillery School in its summary of artillery activities in combat.[39] But not all considered it a disadvantage. Colonel McPheeters (who commanded an M7 battalion in the same division as Major Revie) felt that proper maintenance procedures eliminated maintenance problems.[40] The 1st U. S. Army, reporting on the M12, stated that after six months of combat, all weapons in three battalions were still in action. It attributed this to rugged construction of the chassis and good unit maintenance, backed up by excellent Ordnance support.[41] Lieutenant Scoffer, writing about one of these battalions, stated that in the pursuit across Northern France, the battalion had few maintenance problems.[42] Colonel Kurtz (CO, 14th Armored Division

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[37]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[38]"Artillery Information Service, Memorandum No. 1," p. 13.

[39]"Secret Information Summary, Number One," p. 129.

[40]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 39.

[41]"Artillery Information Service, Memorandum No. 7," p. 21.

[42]Scoffer, p. 30.

Artillery) observed that there was increased wear on the cannon parts of the M7's and M12's compared to the towed 105mm howitzers and 155mm guns.[43]

It appears that maintenance problems were not as serious a disadvantage as had been anticipated earlier, and that then, as today, they could be overcome by proper maintenance procedures.

"Inflexible prime mover."--This disadvantage is linked to the "prime mover out--cannon out" disadvantage, but had not been considered too important prior to World War II. Apparently the experience of the war showed "inflexible prime mover" to be a minor disadvantage, too. Both Major Revie and the Field Artillery School listed it as a disadvantage of self-propelled artillery.[44, 45] Colonel Kurtz cited the flexibility of towed artillery prime movers as an advantage of towed artillery.[46] All of the above artillerymen considered "inflexible prime mover" in the light of ammunition resupply.

Concealment,--Difficulty of concealment was considered more of a disadvantage in the first phase than in the second phase of the argument prior to World War II. The 10th Field Artillery Battalion listed this as a deficiency of self-propelled artillery,[47] as did the 1st U. S. Army.[48] Both organizations considered the high silhouette of the M7 the

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[43]Kurtz, p. 13.

[44]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[45]"Secret Information Summary, Number One," p. 129.

[46]Kurtz, p. 15.

[47]"Notes and Lessons of the Sicilian Campaign," p. 1.

[48]"Artillery Information Service, Memorandum No. 1," p. 13.

drawback in this respect. Colonel Kurtz cited the smaller target presented by towed pieces as an advantage of towed artillery.[49] Major Revie thought the M7 hard to camouflage, and additionally, he stated that it left tell-tale tracks into the position area, whereas the towed weapons could be manhandled.[50]

Limited traverse.--This disadvantage had never been considered as significant as others. Lt Col I. B. Washburn, commenting on the M7, stated that it had to be realigned to its aiming stakes quite often because it was necessary to shift to fire on many targets to the flanks and rear.[51] (He implied that targets from all quarters was a hazard common to artillery with armored divisions.) Major Revie thought that just the physical turning of the M7 was more difficult than shifting trails on the towed howitzer.[52] But Colonel Graham (CO, 4th Armored Division Artillery) felt the M7 could shift faster than the towed 105mm howitzer.[53]

Other disadvantages.--Neither the M7 nor the M12 had an inherent capability for high angle fire. Colonel Kurtz considered this limitation as a disadvantage.[54] Colonel McPheeters (CO, M7 battalion) was able to get high angle fire by siting his M7's on reverse slopes.[55]

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[49]Kurtz, p. 15.

[50]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[51]Lt Col I. B. Washburn, "Armored FA Across France," The Field Artillery Journal, Vol. XXXV, No. 4 (Apr 45), pp. 204-205.

[52]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[53]Kurtz, p. 16.

[54]Kurtz, p. 15.

[55]"Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

There was very little other comment on this limitation. High fuel consumption by self-propelled pieces was a disadvantage in the view of the 1st U. S. Army and Colonel Kurtz.[56, 57] Colonel Kurtz estimated that self-propelled weapons consumed twice as much fuel as the prime movers for towed cannon.[58] There was little other comment on this disadvantage; this dearth of comments might be viewed from the aspect that self-propelled artillery was supporting armored divisions which were geared for large fuel resupply. Major Revie and the 10th Field Artillery Battalion both reported one further disadvantage: the cramped firing crew space on the M7. It was felt that for this reason, the towed weapon could fire faster than the self-propelled version.[59, 60]

The Consensus

The listing of advantages and disadvantages as above is useful in analyzing the experience of World War II with respect to the argument of towed versus self-propelled artillery in the U. S. Army. However, the listing is not the whole story. It might appear that the disadvantages of self-propelled artillery outweighed the advantages by the listing in this chapter, both in numbers of items and numbers of comments. But how did the artillerymen feel overall, in comparing self-propelled artillery with towed artillery?

Two M7 battalion commanders believed self-propelled artillery

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[56] "Artillery Information Service, Memorandum No. 1," p. 13.

[57] Kurtz, p. 15.

[58] Ibid.

[59] "Interviews on Armored Command Activities with Officers of the 1st Armored Division: Italy, November 16-29, 1943," p. 38.

[60] "Notes and Lessons of the Sicilian Campaign," p. 1.

better because of its greater mobility. One M7 battalion commander wrote: "The armored self-propelled M7's with which we were equipped were truly wonderful weapons. . . ." He felt their armor protection key to their superiority over towed weapons.[61] The 1st U. S. Army thought well of the M12 because of its mobility and value in assault fire missions. One armored division artillery commander, discussing artillery for armored divisions, stated: "It goes without saying that all these weapons should be self-propelled."[62] Another armored division artillery commander thought all artillery should be self-propelled.

But one armored division artillery commander, while favoring self-propelled artillery for armored divisions, listed many advantages of towed artillery. He felt there was a need for towed units in non-division artillery. Specifically, he thought both the 155mm howitzer and gun were mobile enough for combat in Europe.[63] The 1st U. S. Army considered that the M7 had no marked advantage over the towed 105mm howitzer. The 10th Field Artillery Battalion, which had referred to the M7's as "white elephants," obviously preferred towed artillery. So did one light artillery battalion commander, who had had combat experience with both towed and self-propelled 105mm howitzers.

On the basis of these artillerymen's views overall, the consensus was for self-propelled artillery--for armored divisions, at least. But this consensus must be weighed by two factors. First, as was stated at the beginning of this chapter, the predominate direct artillery support for armored divisions was by self-propelled units, and the predominate infantry division direct support by towed units.

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[61] Hutton, p. 251. [62] Brown, p. 503. [63] Kurtz, p. 14.

There was, then, a very limited basis for comparison. The best comparison was with the M12 versus towed medium artillery; here the self-propelled version was favored because of its superior mobility.

Second, most of the artillerymen cited in this chapter were closely involved with combat operations and might have seen only "the trees, and not the forest." How many thought armor protection important because one of their batteries had to fight off an infantry attack? How many were impressed with the mobility of self-propelled artillery as they passed a mired towed unit--or felt the opposite because trucks had to be used to keep their M7's on icy roads? Surely the intensity of combat would cause isolated incidents to have profound effects on their views.

Further, what about the interactions of characteristics? If armor protection were an advantage, how much was its increased weight a disadvantage? If mobility effected by track-laying mounts was an advantage, how much of a disadvantage was the increased fuel consumption and maintenance problems?

These questions and others as they pertained to the argument of self-propelled versus towed artillery in the U. S. Army were not answered by the experience, per se, of World War II. A careful, objective post-war analysis would have to be conducted to find the answers.

CHAPTER IV

FROM THE POST-WORLD WAR II ANALYSIS TO 1955

The Post-World War II Analysis

With the end of the war, and even before, many boards of officers were convened to analyze the experience of World War II. This portion of this chapter will present the findings of the more important of these boards as they apply to the argument of towed versus self-propelled artillery in the U. S. Army.

1944 Field Artillery School Report.--In November 1944, a special board of officers was convened at the Field Artillery School to review wartime developments in field artillery. Headed by Maj Gen Ralph McT. Pennell, the school's commandant, the board was to conduct their review with a view to initiating guidelines for current and post-war development.[1] With respect to artillery transport, the board concluded:

> Both towed and self-propelled weapons are necessary in varying proportions within any artillery echelon. The relative proportion of each will be determined by the mission, the mobility and the theater. The range of this proportion should include all calibers and weapons up to include the 155-mm gun M1[2] and 8-inch howitzer.[3]

This report omitted two significant points. First, there was

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[1] The Field Artillery School, "Report of Special Board Appointed to Review Developments in Field Artillery" (Fort Sill, Oklahoma, 27 Nov 44), p. 1.

[2] A later model gun than the G. P. F. 155mm gun.

[3] "Report of Special Board Appointed to Review Developments in Field Artillery," p. 4.

no discussion in the report concerning the pros and cons of towed versus self-propelled artillery. There was no explanation of how the "varying proportions" were to be determined, nor any indication as to the effect the mission or theater would have on the proportion of towed to self-propelled artillery. Second, there was no discussion of factors which led the board to recommend that all calibers have a portion self-propelled.[4]

1944 Equipment Review board.--The Army Ground Forces convened a board in late 1944[5] to study all weapons used by the U. S. Army and to determine change necessary to properly equip the post-war army.[6] It recommended that self-propelled chassis should be developed for all cannon calibers, except the 75mm pack howitzer. Further, it recommended that in developing self-propelled artillery materiel, chassis be designed specifically for self-propelled artillery, in order to save weight. Self-propelled chassis of World War II had been chassis designed for tanks and were quite heavy.[7] The board concluded, in the same wording as the 1944 Field Artillery School Report that "both towed and self-propelled weapons are necessary in varying proportions. . . . The relative proportion of each will be determined by the mission, the mobility and the theater. . . ."[8] Again, there was no explanation

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[4] At this time, the only self-propelled artillery larger than the 105mm howitzer in use was the M12 (155mm gun). Other pieces were under development.

[5] The board was given a copy of the Westervelt Report as a guide.

[6] Headquarters Army Ground Forces, "Report of Board of Officers to Study the Equipment of the Post War Army" (Washington: The Army War College, 20 Sep 45), Part I.

[7] Ibid., Annex D, p. 2.

[8] Ibid.

of how the "varying proportions" were to be determined, nor any indication as to the effect the mission or theater would have on the proportion.

1945 European Theater Board Report.--In late 1945, Headquarters, European Theater of Operations appointed a board to analyze the strategy, tactics, and administration of the U. S. Army in the theater during the war.[9] The board's approach seemed to be: If the U. S. Army had to fight the war in Europe again, what would be done as before, and what would be done differently? There was little consideration of the nature of future wars. The board was divided in to many sections to examine in detail the many facets involved. One hundred thirty-one separate studies made up the entire report. Germane to this paper are studies by the Artillery and G3 sections.

The Artillery Section found that the M7 was very successful in providing direct support, primarily because of its armor protection, tactical mobility, and ability to occupy positions rapidly.[10] The section recommended that armored divisions be equipped with self-propelled light and medium artillery for the same advantages demonstrated by the M7.[11] It cited the following as advantages of towed artillery for infantry divisions:

--fewer maintenance problems

--easier to emplace and conceal; less noise

--lighter weight, particularly for crossing bridges

--better tactical mobility in bad weather (mud and ice)

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[9]Headquarters United States Forces, European Theater of Operations, "Report of the General Board: Study of the Organization and Equipment of Field Artillery Units" (ca. 1946).

[10]Ibid., p. 12.

[11]Ibid., p. 13.

--better strategic mobility

--high angle fire capability

--greater on-carriage traverse

--less fuel consumption.[12]

The following were cited as advantages of self-propelled artillery for infantry divisions:

--better tactical mobility in good weather

--armor protection for the crew

--ability to occupy positions rapidly.[13]

The Artillery Section concluded that infantry division light and medium artillery should be towed.[14]

The G3 Section, in its study of the infantry division, did not agree with the Artillery Section's conclusions concerning infantry division artillery weapons. The section considered armor protection very important for artillery because of air attacks and the proximity fuze. It recommended the infantry division artillery be equipped with self-propelled cannon for their armor protection. The section recognized the M7 to be too heavy, without overhead armor, and without a high angle fire capability, but advocated the infantry division be equipped with M7's at that time.[15]

For non-division artillery, the Artillery Section recommended the M7 because it might be in support of armor units. The section went

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[12] Ibid., pp. 3-4. [13] Ibid., p. 4. [14] Ibid., p. 5.

[15] Headquarters United States Forces, European Theater of Operations, "Report of the General Board: Study of the Organization, Equipment and Tactical Employment of the Infantry Division" (ca. 1946), p. 9.

on to state that the M7 had proved its worth because of its good tactical mobility.[16] It recommended that in addition to M7 battalions, some 155mm gun battalions be self-propelled, and all other non-division artillery be towed.[17]

Of the reports considered thus far in this chapter, the 1945 European Theater Board Report was by far the most detailed and exhaustive. It is curious that there should be the opposing conclusions reached concerning artillery for the infantry division.[18] If one considers the listings by the Artillery Section of the advantages of towed artillery for infantry divisions, one might wonder why towed artillery was not also recommended for armored divisions. On the other hand, the Artillery Section in discussing non-division artillery, felt that on those occasions when M7 battalions had supported infantry units, the support had been satisfactory. Perhaps, because of the pre-war thoughts of self-propelled artillery with armored forces and the habitual association of self-propelled artillery during the war, a tradition of "self-propelled for armor, towed for infantry" had been established among artillerymen.

1946 Artillery Conference.--In March 1946, an artillery conference was conducted at Fort Sill to discuss all phases of artillery, and to make recommendations for future artillery development and employment.[19]

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[16]"Report of the General Board: Study of the Organization and Equipment of Field Artillery Units," p. 19.

[17]Ibid., pp. 46-47.

[18]The Artillery Section took cognizance of the G3 Section's conclusions; knowing, it still dissented.

[19]The Field Artillery School, "Report Based on Studies Conducted at the Artillery Conference" (Fort Sill, Oklahoma, Mar 46).

This conference was divided into committees to study different phases in detail. The Equipment Committee listed the following advantages and disadvantages of self-propelled artillery at the beginning of its portion of the conference report:

Advantages:

--rapidly emplaced

--less cargo, road space

--cheaper to manufacture[20]

--better tactical mobility

--armor protection, primarily for position defense

--better for development of mechanical ammunition handling

--less personnel required for the crew.

Disadvantages:

--heavy weight

--lack of space for ammunition

--difficulty of concealment because of high silhouette

--no high angle fire capability

--high fuel consumption

--poor strategic mobility.[21]

The committee's opinion of World War II self-propelled artillery was that it had not proved entirely satisfactory because it was constructed from towed cannon components and tank chassis. The committee majority recommended the goal for artillery to be all weapons self-propelled. It

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[20] This advantage was not substantiated in the report. It does not seem reasonable, in view of all other opinions that self-propelled cannon were more expensive to produce.

[21] "Report Based on Studies Conducted at the Artillery Conference: Committee on Equipment," Tab 1A, pp. 1-3.

recommended that self-propelled artillery be developed with the highest priority. However, for the present, the committee majority recommended that armored division and non-division light artillery be self-propelled, and that infantry division artillery be towed until a lighter mount with a lower silhouette could be developed. It recommended that both towed and self-propelled versions of medium and heavy artillery be developed, corps artillery to be self-propelled, army to be towed.[22]

The committee's recommendations were not unanimous. There were two dissensions--at opposite ends of the spectrum. One group estimated that it would take ten years to develop a completely satisfactory self-propelled cannon, and it urged that infantry divisions be equipped immediately with existing light self-propelled artillery. This group considered that light self-propelled artillery must have a high angle fire capability to be completely satisfactory.[23] The other group recommended that infantry division artillery be towed primarily because self-propelled artillery was too heavy. It cited greater maintenance problems and "inflexible prime mover" as other disadvantages of self-propelled artillery. Further, considering the economic aspects of artillery transport, this group thought self-propelled cannon to be expensive and that the United States could not produce enough to equip the entire Army in war.[24] These last two disadvantages of self-propelled artillery are similar to those listed during the second phase of the argument prior to World War II.

The 1946 Artillery Conference was more inclined to consider favorably self-propelled artillery for infantry divisions than had

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[22] Ibid., pp. 1-4 [23] Ibid., Tab 1B, p. 3. [24] Ibid., p. 4.

similar bodies before. The 1946 Artillery Conference also estimated the effects of future technical advances more than similar boards had before.

1946 War Department Equipment Board.--The War Department Equipment Board was established in 1946 to review types of equipment required for the post-war Army.[25] As a general preface to its considerations for all types of equipment, the board wrote that it felt that the United States' production capacity would not be brought to bear in future wars as it had in World War II, and that future wars would have to be fought with the materiel on hand at the outset.[26] Specifically, the board recommended the development of both towed and self-propelled artillery, except very light and very heavy artillery.[27] The same cannon should be used for both towed and self-propelled configurations, and since self-propelled materiel was more difficult to develop, the cannon should be developed for self-propelled artillery and adapted for use with towed artillery.[28] This was the reverse of the practice for constructing World War II artillery materiel. Lastly, the board recommended self-propelled artillery with splinter-proof armor, including overhead armor, for armored divisions.[29]

1949 Army Field Forces Advisory Panel on Field Artillery.--In 1949, the Army Field Forces established an advisory panel to review the

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[25] Letter, The Adjutant General's Office, Subject: "Appointment of War Department Equipment Board" (2 Oct 45).

[26] U. S., War Department, "Report of the War Department Equipment Board" (Washington, 19 Jan 45), p. 1.

[27] The report implied that very light artillery was the 75mm howitzer. Both very light and very heavy artillery was to be towed only.

[28] "Report of the War Department Equipment Board," p. 23.

[29] Ibid., p. 24.

current U. S. Army policies, doctrine, and military characteristics pertaining to field artillery weapons. Headed by Maj Gen Clift Andrus, the panel was also to initiate actions to secure appropriate military characteristics for field artillery weapons and equipment. Lastly, it was to report on the implementation of recommendations of the 1946 Artillery Conference and the 1946 War Department Equipment Board report.[30]

The panel made several assumptions for wars of the future. First, the earliest likely major war would not occur until 1952, and this war would be a nuclear war in which the battlefield would be devastated, particularly lines of communications. Second, the enemy would have superior manpower. From these assumptions, the panel generalized that the U. S. Army must have a high degree of cross-country mobility, and the United States must use its superior technology and production potential to improve mechanical means of waging war.[31] From these two theses, the panel concluded that all new artillery weapons should be self-propelled (except special types[32]), and that field artillery weapons in the infantry division artillery should be air transportable.[33] These two conclusions imply that the panel envisioned the elimination or reduction of the heavy weight disadvantage of self-propelled artillery. The panel stated specific requirements for self-propelled models

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[30] U. S., Department of the Army, "Report of the Army Field Forces Advisory Panel on Field Artillery" (Washington, 18 Feb 49), p. 2.

[31] Ibid., pp. 3-4.

[32] The "special types" were not defined.

[33] "Report of the Army Field Forces Advisory Panel on Field Artillery," p. 6.

of the 105mm howitzer, 155mm howitzer, 155mm gun, 8" howitzer, and 240mm howitzer.[34] The key advantage for self-propelled artillery in the panel's view was its better cross-country mobility.

The end of the post-war analysis.--It is not really possible to establish a precise time or event that marks the end of the analysis, with respect to artillery transport, of World War II. The 1949 Army Field Forces Advisory Panel on Field Artillery made little reference to the late war; its report was more of a forecast of the future rather than an analysis of the past. Other board and panel reports that followed were made from similar viewpoints. For this reason, the 1949 Army Field Forces Advisory Panel on Field Artillery Report is used in this paper as the terminal point of the post-war analysis.

The Korean Conflict

The Korean conflict had many characteristics affecting artillery. It was fought, for the most part, over terrain much more rugged than in Europe; it was, at the beginning, a war of movement, and for much of the war, one of static fronts reminiscent of World War I. There were many times when artillery positions were overrun and cannon lost; these actions probably had the most vivid impact on artillerymen.

There was not as high a proportion of self-propelled artillery as in Europe during World War II; there were no armored divisions in Korea. There were, however, non-division battalions that saw much action. Lt Col Leon F. Lavoie, commander of a separate self-propelled 155mm howitzer battalion in Korea, considered tactical mobility the key advantage of self-propelled over towed artillery. He felt the armor

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[34] Ibid.

protection of self-propelled artillery key to giving the cannon the ability to defend themselves. He also thought any increased maintenance problems of self-propelled artillery could be overcome.[35]

Lt Col Jerry F. Dunn, commander of a separate self-propelled 155mm gun battalion during the conflict, wrote on the role of self-propelled artillery in static warfare. His battalion fired many assault fire missions, which he felt were common static warfare missions. Self-propelled artillery was better for these missions because it had armor protection and could occupy and withdraw from positions rapidly.[36]

The Artillery School, in a study of artillery of the Korean conflict, concluded that self-propelled artillery was better than towed for that conflict. The study cited better tactical mobility for employment on broad fronts over rough terrain, and armor protection for position defense as key advantages. The study pointed out that self-propelled artillery must be able to fire high angle fire to be truly superior to towed artillery.[37]

Colonel La Voie, writing about both World War II and the Korean conflict, considered the ability of self-propelled artillery to protect itself very important. His studies showed that towed artillery units were overrun more often than self-propelled units in both wars. He attributed self-propelled artillery's better record in this respect to

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[35]Lt Col Leon F. La Voie, "Make Mine SP," U. S. Army Combat Forces Journal, Vol. II, No. 7 (Feb 52), pp. 32-33.

[36]Lt Col Jerry F. Dunn, "Self-Propelled Artillery in Positional Warfare," The Army Combat Forces Journal, Vol. IV, No. 4 (Nov 53), pp. 14-17.

[37]The Artillery School, "Artillery in Korea" (Fort Sill, Oklahoma, 1953), p. 9.

its better tactical mobility, its armor protection, and its ability to occupy positions more rapidly. He did not, however, advocate abandoning towed artillery completely.[38]

The impact of the Korean conflict upon the argument of towed versus self-propelled artillery in the U. S. Army was to emphasize the advantages of self-propelled artillery in defending itself. It did not bring out any new facet of the argument.

The Future

With two recent wars behind it, the U. S. Army was continuing the argument of towed versus self-propelled artillery on essentially the same grounds as when it started. A new aspect was introduced as the time frame of this paper ends. In 1952, Lt Col Bidwell Moore wrote that the U. S. Army had never had self-propelled light artillery. He described four categories of artillery: tank destroyer artillery, assault gun artillery, armored artillery, and self-propelled artillery. He grouped the first three categories together as all having armor protection, which resulted in their being quite heavy. True self-propelled artillery, he felt, should have no armor and be mounted on a light chassis. This would be a weapon with excellent tactical mobility and be able to occupy positions rapidly--key factors, he thought, for artillery transport.[39] Perhaps few artillerymen would agree with Colonel Moore's classification, but the concept of light, unarmored self-propelled mounts was a concept that was to be considered carefully.

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[38]Lt Col Leon F. La Voie, "ARMORED Artillery is the Thing," Armor, Vol. LXI, No. 5 (Sep-Oct 52), pp. 10-13.

[39]Lt Col Bidwell Moore, "Why Not SP?," The Army Combat Forces Journal, Vol. III, No. 4 (Nov 52), pp. 30-31.

A variation on the light-weight, self-propelled mount was suggested by Capt John C. Burney, Jr. in 1954. His idea was to develop a self-propelled 76mm or 90mm gun, weighing about four tons, that could be air-dropped. He felt the tactical mobility of such a weapon was key to its value with airborne forces.[40]

These two concepts, calling for a self-propelled cannon embodying new technology, end the account of the argument of towed versus self-propelled artillery in the U. S. Army prior to 1955. For almost four decades it had been an important argument among artillerymen, and it was to continue to be an important one. But in the future, it would be conducted within the framework of a technology that was changing much more rapidly than it ever had before.

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[40] Capt John C. Burney, Jr., "Self-propelled Guns Can Be Dropped," The Army Combat Forces Journal, Vol. V, No. 3 (Oct 54), pp. 52-54.

CHAPTER V

SUMMARY, ANALYSIS, AND CONCLUSIONS

Summary

The most significant factor in the argument of self-propelled versus towed artillery in the U. S. Army prior to 1955 was the limited amount of materiel upon which proponents of either form of artillery transport could base their judgements. Towed artillery transport showed the biggest advance in the period prior to World War II, evolving, in the case of light artillery transport, from three-mile-an-hour farm tractors to the 2½ ton 6 x 6 truck capable of 45 mph on the highways. This reflected the ascendent position of the United States in motor transport during the two decades between the World Wars.

Self-propelled artillery advanced very little in the same two decades. The only models of self-propelled artillery that saw extensive combat were improvisations that utilized neither the skill of the gunsmith nor the technology of the automotive engineer. The slow progress made is reflected in the comparison in Table 6 of some of the characteristics of the earliest self-propelled light artillery and the World War II self-propelled light artillery pieces. This table does not show other important characteristics such as mechanical reliability and time to prepare to fire, but it does suggest that little improvement was made in 22 years.

TABLE 6

COMPARISON OF HOLT MARK VII AND M7

Characteristics	Holt (1919)[a]	M7 (1941)[b]
Caliber	75mm gun	105mm howitzer
Weight	5½ tons	23½ tons
Speed	15 mph	23 mph
Maximum elevation	45°	33°
Total traverse	28°	38°
Armor protection	none	against ground fire only; no overhead protection

[a]Above, p. 3.

[b]Above, p. 11.

The argument of towed versus self-propelled artillery quickly took shape as to the advantages of one form of transport compared to the other. As animal transport was replaced by motor transport, the argument took the form of the advantages and disadvantages of self-propelled artillery, compared to towed artillery. Further, with the beginning of the U. S. armored forces, there grew an increasing tendency to consider self-propelled artillery solely for armored forces.

This tendency was manifested by the experience of World War II, with self-propelled artillery supporting armored divisions almost exclusively. It was natural for the artillerymen fighting the war to consider self-propelled and towed artillery in this light. The post-war analysis would have to consider carefully other possible applications of both towed and self-propelled artillery.

The post-war analysis, initially at least, did not give this careful consideration. The statement, "both towed and self-propelled weapons are necessary in varying proportions within any artillery echelon,"[1] without any further explanation epitomizes the narrowness with which the experience of the war was viewed. Additionally, the post-war analysis appeared to be bound to the philosophy of self-propelled artillery for armor, towed for infantry. It was only toward the end of the analysis that self-propelled artillery was considered for all types of divisions. There seems to have been no consideration from the opposite standpoint--towed artillery for all types of divisions, including armored divisions. The Korean conflict magnified the advantages of self-propelled artillery in defending itself, but added little else to the argument.

The argument in 1955 had not changed much from that of 1919, as indicated by Table 7, which compares the Westervelt Board Report (1919) with the 1946 Artillery Conference Report concerning the advantages and disadvantages of self-propelled artillery compared to towed artillery. Only with the advent of new technology could the grounds upon which the argument of towed versus self-propelled artillery in the U. S. Army be expected to change very much.

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[1] Above, pp. 45, 46.

TABLE 7

COMPARISON OF WESTERVELT BOARD REPORT (1919)[a] AND 1946 ARTILLERY CONFERENCE REPORT[b]

Advantages Cited by Both Reports
--Rapidly emplaced
--Better tactical mobility
Disadvantages Cited by Both Reports
--Heavy weight
--Poor strategic mobility
Disadvantages Cited by Neither Report
--"Prime mover out--cannon out"
--Maintenance problems

[a]Above, pp. 16-17.

[b]Above, p. 50.

Analysis

This portion of this chapter will address itself to the analysis of the validity of the reasons used in the argument of self-propelled versus towed artillery. The format will be a discussion of the most often cited advantages and disadvantages of self-propelled artillery compared to towed artillery.

Advantages of self-propelled artillery.--Throughout the period discussed in this paper, the most often cited advantage of self-propelled artillery was its capability for being rapidly emplaced. In the case of medium and heavy artillery, self-propelled cannon could go into action almost one-half hour sooner than its towed equivalent. The

difference in time for the two light artillery configurations was measured in minutes,[2] but considering light artillery's usual mission of direct support, these minutes were often crucial. Self-propelled artillery's advantage in rapid occupation of position was a significant advantage.

The next most often cited advantage was self-propelled artillery's greater tactical mobility. This was attributed to self-propelled cannon because, in almost all cases, they were track-laying vehicles. In the earlier years of the argument, when towed artillery was moved by track-laying tractors, this advantage was not cited too often. As trucks became the prime movers for towed artillery, self-propelled artillery became to be considered as having greater tactical mobility. The experience of World War II does not give self-propelled artillery a clear advantage in this respect, except perhaps, in sand. The post-war analysis often cited self-propelled artillery as having greater tactical mobility. This appears to have been based more on presumption rather than fact. Self-propelled artillery did not have a superiority in tactical mobility to have a significant advantage in this respect.

Armor protection was considered as an advantage for self-propelled artillery in the later years of the argument. It was considered particularly important for light artillery, especially for giving cannon the capability for self-defense against ground attack. Taken by itself, armor protection was a marked advantage for light

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[2] U. S., Department of the Army, Field Artillery Gunnery, FM 6-40, Change 2 (Washington: U. S. Government Printing Office, 16 Sep 64), Table 1.

artillery, but considering the weight armor plate added to the piece, armor protection became less significant. For medium and heavy artillery, which was usually emplaced further behind the line of contact than light artillery, armor protection was not a significant advantage.

Overall, then, the only clear-cut advantage of self-propelled artillery prior to 1955 was its capability for rapid occupation of positions.

Disadvantages of self-propelled artillery.--Almost every report and article concerning self-propelled artillery listed the heavy weight of self-propelled cannon as a disadvantage; both proponents and opponents of self-propelled artillery listed it. More often than not, heavy weight was cited as the most serious disadvantage. Heavy weight lessened tactical mobility and increased fuel consumption. Heavy weight resulted, in part, from inherent characteristics of track-laying vehicles with their heavy tracks and requirement for more powerful and heavier engines. For World War II models, the use of tank chassis, which were armored, and the addition of armor plate added more weight. Heavy weight, per se was not significant; it was significant in its effect on other factors, particularly tactical mobility.

The disadvantage "prime mover out--cannon out" was inherent to self-propelled artillery. It became a disadvantage from two aspects: inoperability of the piece because of enemy action, and inoperability because of mechanical failure. Although there were several forms of enemy action, counterbattery fire was the greatest threat. Self-propelled artillery's ability to displace rapidly from, as well as into, positions tended to reduce the threat from counterbattery fire.

Mechanical failure was tied closely with maintenance problems

associated with the more complex (than towed) self-propelled weapons. In the early years of the argument, when automotive technology was in its infancy, maintenance problems were many and supported "prime mover out--cannon out" as a disadvantage. The experience of World War II and the Korean conflict did not show maintenance problems to be a major disadvantage of self-propelled artillery compared to towed artillery. "Prime mover out--cannon out" was an intuitive reason against self-propelled artillery; the facts do not support it as a significant disadvantage.

Both limited traverse and lack of a capability for high angle fire were mechanical limitations of the cannon itself as it was mounted on the chassis. Increased traverse could have been obtained by the use of a turret, albeit adding weight, and higher elevations by appropriate mounting or shortening the recoil distance. Both were within the state of the art in the period prior to 1955. It is understandable that the artillerymen using self-propelled cannon in combat considered these two mechanical limitations disadvantages of their weapons in particular, but it is not so clear why those making the post World War II analyses still considered these two limitations general disadvantages of self-propelled artillery. Limited traverse and a lack of high angle fire capability were not significant disadvantages of self-propelled artillery.

The disadvantages of self-propelled artillery distill to one: heavy weight and attendant limitations. Within the limitations of the materiel available, and the technology that could be tapped, heavy weight was a significant drawback that appeared to be inherent to self-propelled artillery prior to 1955.

Conclusions

By 1955, much could be said in favor of both towed and self-propelled artillery. There was a tendency, because of advances in technology, for self-propelled artillery to be considered more favorably as a universal mode of artillery transport. But by 1955, no clear-cut preponderance of opinion existed for either towed or self-propelled artillery. This was probably just as well; much remained to be done to improve the materiel for both towed and self-propelled artillery.

The artillery in the U. S. Army in 1955 was both self-propelled and towed. This dichotomy of artillery transport was due to the argument that had been conducted through the years. In general, the argument had been conducted well, by proponents of both forms of artillery transport. The only criticism that might be made would be towards those in the post World War II era who failed to base their judgement on what could be done, rather than what had been done.

And this is the lesson that can be drawn from the argument of towed versus self-propelled artillery in the U. S. Army prior to 1955: In the present age of rapid advances in technology, it is important to take appropriate cognizance of equipment that <u>can</u> be made, as well as that which is made. Further, to best use technology, soldiers must learn to establish characteristics desired in materiel and require industry to design equipment to meet these characteristics.

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